GROWER GROUP CASE STUDY ON NEW FARMING PRACTICES IN THE HERBERT

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KEYWORDS: Grower Group, Farming System, Legume, Controlled Traffic, GPS, Economics.

Abstract

GROWERS working together has proven to be a successful method for improving the utilisation of farm resources and accelerating the adoption of the Sugar Yield Decline Joint Venture principles (SYDJV). The Pinnacle Precision Farming Group was formed in 2004 with the aim to bring together the ideas, knowledge and resources of growers in the Herbert region. Along with their common interest in controlled traffic, minimal tillage and crop rotations, the grower group utilise a farm machinery contractor to provide some of their major farming operations. This paper provides an insight into the changes made by the Pinnacle Precision Farming Group and their journey to adopt the new farming system practices. This paper also details the changes made by the group machinery contractor and a comparison of the old and new farming systems used by a group member. A focus point of the document is the impact of the new farming system on the economic, social and environmental components of the farming business. Analysis of the new farming system with a legume crop rotation revealed an increase in the farm gross margin by $22 024 and, in addition, a reduction in tractor operation time by 38% across the whole farm. This represents a return on marginal capital of 14.68 times the original capital outlay required by the group member. Using the new farming system without a legume crop will still improve the group members whole of farm gross margin by $6839 and a reduce tractor operation time by 43% across the whole farm. The Pinnacle Precision Farming group recognise the need to continually improve their farming businesses and believe that the new farming system principles are critical for the long term viability of the industry.

Introduction

The sugarcane industry is currently going through a major change in the way growers manage and operate their farming business. This change has been brought about by the introduction and adoption of findings from the Sugar Yield Decline Joint Venture (SYDJV). The research conducted by the SYDJV provided recommendations on ways to improve the sustainability of our farming system from an economic and environmental perspective. The main components of the new farming system include the use of controlled traffic, minimum tillage and legume crop rotation.

The SYDJV research identified that the current farming practices were resulting in poor soil biology, excessive compaction and other damage to our soil structure. Growers were encouraged to change their practices in order to curb the current yield decline effect that has been seen in the sugar industry. In addition to the SYDJV findings, sugarcane growers have had to look for new ways to manage their business and efficiently use their land, labour, finance and knowledge resources. Working together with other growers to provide support and knowledge has proven to be one method for improving the utilisation of resources and accelerating the adoption of the SYDJV principles.

The Pinnacle Precision Farming Group was formed in 2004 with the aim to bring together the ideas, knowledge and resources of growers in the Herbert region. The growers in the Pinnacle Precision Farming Group all have a common interest in using the Morris family to provide contracting services on their farms. The group have made some major changes in recent time with the adoption of disc opener planting and controlled traffic. The group also anticipates the use of legume fallows by all of the members more frequently in the future. This report provides an insight into the changes made by a member of the Pinnacle Precision Farming Group and the Morris family contracting business in order to adopt the SYDJV practices and achieve efficient utilisation of resources.

Pinnacle Hill Farming Group

The Pinnacle Precision Farming Group was formed in 2004 by a group of six growers interested in controlled traffic, minimal tillage and legume rotations. Previous to 2004, the group members were working together on an informal basis and all had a common link through the use of the Morris family's farm machinery contracting services. The formation of the group in 2004 was stimulated by the successful application to the Sugar Research and Development Corporation (SRDC) for a Grower Group Innovation Project. The SRDC grant provided the group with an opportunity to develop and undertake a plan to adopt the new farming system principles. The funding assisted with the building of a three-row mound former and the modification of a billet planter to double disc openers. The group identified the need to work together in order to minimise the change in capital required to adopt the new farming system and to share skills and knowledge.

The group consists of three full time cane farmers, one tradesman/farmer and one machinery contractor/farmer (Morris family) who provides various machinery operations to the members. The group members have various skills and backgrounds which proved to be a strength in providing additional knowledge and resources to undertake the project.

Collectively, the Pinnacle Hill farming group grows cane on 590 hectares of land in the Helen's Hill, Toobanna and Forest Home areas. The soils used for sugarcane production vary considerably and include clays, silty clays, course red sandy loam, terrace silt loam and river overflow (Wood *et al*., 2003). The median rainfalls over the period 1992–2005 were 1285 mm at Helen's Hill, 1496 mm at Toobanna and 1637 mm at Forest Home. The vast difference in farming environments provided a challenge for the group to develop a farming system that is versatile and meets the group requirements.

Morris family contracting business

The development and modification of implements that are suitable for the new farming system has been a major constraint to adoption to date. In order to stimulate the change, the Pinnacle Precision Farming Group along with the Morris family contracting business made a significant investment in the modification and acquisition of the machinery necessary to adopt the new farming system.

The Morris family contracting business has been a key driver in the success of the group through providing the necessary labour, machinery and expertise required for the new

farming system operations. The Morris family contracting business was established in 1990 and consists of three brothers who operate the business. The Morris family provides planting, fertilising, bed forming and cultivation services to growers across the Herbert River district. The Morris family are strong believers in innovation and over time have made several changes to their contracting business. Some of the most recent changes are related to the Pinnacle Precision Farming group project and include:

- 2006 – Purchase of a three row mound former worth $25 000;
- 2005 – Acquisition of a GPS auto-steer unit worth $60 000;
- 2005 – Modification of a HBM billet planter to dual row double disc openers worth $25 000.

The acquisition of this equipment enabled the Pinnacle Precision Farming group to adopt the new farming system principles in a cost effective and efficient manner. Groups members were able to access the latest technology and labour necessary to undertake the operations with a minimal amount of capital change required within their own farming business.

Grower group member

The Reid sugarcane farm, owned and run by the Reid family, is approximately 8 km south of Ingham in the Pinnacle Hill area. The Reids are a member of the Pinnacle Precision Farming group and utilise the Morris family contracting services as part of their farming operations. The Reids started their sugarcane farming business in 1995 and currently farm 210 hectares of sugarcane land on soils ranging from clays to course red sandy loams. The Reids identified the need to shift to a new farming system following a wet year in 1998 which resulted in stand-over cane and severe paddock damage. The wet year highlighted the importance of controlled traffic and was one of their main motivations for making the change to a new farming system. They also saw the need to improve the productivity and sustainability of their farming business.

As part of the Pinnacle Precision Farming group, the Reids were required to make very few changes to their capital investment in order to change to the new farming system. Table 1 provides a comparison between the equipment required for the old and new farming system operations on the Reid farm. Since the adoption of the new farming system, the Reid family will no longer require a grubber, line marker and cut away equipment as part of their machinery operations.

Table 1— Implements required for old and new farming systems.

Old system (1997)	New system (2006)
Offset disc	Offset disc
Ripper	Ripper
Fertiliser box	Weeder
Hilling up	Hilling up
Grubber	Fertiliser box
Cut away	Sprayer (tracking legs)
Weeder	Sprayer (boom)
Sprayer (tracking legs)	Legume planter
Sprayer (boom)	
Line marker	

Table 2 provides a summary of the capital outlay for the Reids' to change to the new farming system. The change in capital was minor because of utilising the Morris family

contracting services for some of their major farm operations. The harvester modifications were relatively simple and included an elevator extension that was provided by the contractor. The harvester operator also removes the floating shoes before harvesting the dual row cane.

Table 2—Capital outlay to change to the new farming system.

Purchases	
Widen 2 tractors	$400
Modify fertiliser box	$0 (contractor)
Modify sprayer	$1100
Modify harvester	$0 (contractor)
Cane planter	$0 (contractor)
Legume planter	$0 (contractor)
Total	$1500

Economics analysis of old versus new farming system

The economic analysis will focus on the difference in farming systems between 1997 and 2006 for the Reids' farm. Economic analysis was conducted using the Farm Economic Analysis Tool (FEAT) developed by the DPI&F FutureCane initiative. FEAT is a computer based program designed specifically for cane farmers and allows grower to undertake a whole of farm economic analysis or to compare the economics of various components of a new farming system (Cameron, 2005).

This tool provides accurate economic analysis because of the detail of the information entered into the program. Variable costs are based on details such as rates of chemical, kilograms of fertiliser and machinery operations for a particular crop class. Machinery operating costs are based on the tractor size, fuel consumption, implement speed, width, field efficiency and repairs and maintenance.

FEAT also calculates the tractor labour required for each farming system based on the work rate for each operation. A comparison between the costs of two different farming systems can be made by applying the current input prices to both the current and historical farming systems. The cost comparisons are provided on a per hectare basis.

The characteristics of each system are outlined in Table 3. The old system is based on the Reids conventional farming system in 1997 using a row spacing of 1.55 m single row planted with a furrow opener planter. The new farming system is based on their current practices in 2006 and consists of 1.9 m dual row planted with a double disc opener planter onto flat ground. The Reids also grow legumes (Rongai) on their fallows where possible. Since changing to the new farming system, the Reids believe that they have maintained their farm productivity and improved the ability to harvest their farm during wet years.

The productivity figures used for the conventional system and new farming system scenarios are based on the average productivity from 2003–2005. It is anticipated that the farm productivity will improve by at least 5% for the new farming system with a legume fallow because of improved soil health and nutrient benefits. Research conducted in sugarcane during 1994–1995 has indicated that a legume fallow can provide a significant improvement in crop yield compared to a bare fallow (Garside *et al*., 1997).

This paper will focus on three economic analysis scenarios: 1) old farming system, 2) new farming system 2006 and 3) new farming system and a legume fallow crop.

In today's dollars, the new farming system with a legume fallow provides the largest increase in the farm gross margin across the total farming area ($104/ha) because of the

improvement in sugarcane productivity and cost savings related to the new farming system (Table 4). This represents an increase in the total farm gross margin by $22 024 and a return on marginal capital of 14.68 times the original capital outlay (Table 5). The new farming system without legumes provides an increase in the total farm gross margin by $6839 and a return on marginal capital of 4.55 times the original capital outlay.

In both situations the return on marginal capital is quite high and substantiates the decision to move towards the new farming system. In addition to the high return on marginal capital, the time taken to complete the farm tractor operations has decreased considerably by 43% (1.32 hrs/ha → 0.75 hrs/ha) with the new system and 38% (1.32 hrs/ha → 0.81 hrs/ha) with the new system and a legume fallow (Table 4).

Table 6 outlines the growing cost per hectare for each farming system across the entire farming area. The biggest saving in the new farming system is in land preparation costs ($47.51/ha → $13.96/ha) and weed control ($51/ha → $34/ha).

Table 3—Characteristics of farming systems.

Characteristics	Old system	New system	New system and legume fallow
Planting width	1.55 m	1.9 m	1.9 m
Planting method	Furrow opener – contractor	Double disc – contractor	Double disc – contractor
Planting rate (tc/ha)	7.5	11	11
Row configuration	Single	Dual row at 0.5 m spacing	Dual row at 0.5 m spacing
Land preparation	6 x offset disc 3 x ripper 1 x line marking	3 x offset disc 2 x ripper	3 x offset disc 2 x ripper
Legumes	No	No	Yes (broadcast Rongai)
Controlled traffic	No	Yes	Yes
GPS	No	Yes	Yes
Plant cane fertiliser	Planting – DAP(s) Top dress – 51/51	Planting – DAP(s) Top dress – 51/51	Planting – DAP(s) Top dress – Potash
Ratoon cane fertiliser	141(s)	141(s)	141(s)
Plant weed control	2 x grubber 1 x cut away 1 x hilling up Chemical	1 x inter-row ripping 1 x weeder 1 x hilling up Chemical	1 x inter-row ripping 1 x weeder 1 x hilling up Chemical
Ratoon weed control	Chemical	Chemical	Chemical
Insect control	Lorsban® at planting	Lorsban® at planting	Lorsban® at planting
Disease control	Bumper® at planting	Bumper® at planting	Bumper® at planting

The growing costs of the new farming system with a legume fallow are slightly higher than the new farming system with a bare fallow because of the additional expenses associated with growing a legume crop for green manure.

Table 4—Farming system gross margins and tractor hours.

	Old system (1997)	New system (2006)	New system (2006) and legume fallow
Price per tonne sugar	$330	$330	$330
Average yield cane	88 t/ha	88t/ha	93t/ha
Gross margin per hectare	$1071.64/ha	$1104.21	$1176.52
Tractor labour h/ha cane	1.32 hrs	0.75 hrs	0.81 hrs
Increased gross margin/ha	$0/ha	$32.57/ha	$104.88/ha

*New system and legume fallow assumes a 5% increase in cane yield

Table 5—Return on marginal capital.

Increase in farm gross margin New system = 210ha x $32.57/ha = $6839.70 New system and legume = 210ha x $104.88/ha = $22024.80
Return on marginal capital New system = ($6839.70/$1500) x 100 = 455% (4.55 times original capital outlay) New system and legume = ($22024.80/$1500) x 100 = 1468% (14.68 times original capital outlay)

Table 6—Cost of growing cane per hectare.

	Old system	New system	New system and legume fallow
	$/ha	$/ha	$/ha
Land preparation	47.51	13.96	13.96
Legume	–	–	7.49
Planting + seed	85.23	101.00	101.00
Fertiliser	301.46	301.46	294.21
Weed control	51.35	34.45	39.02
Insect control	2.74	4.26	4.26
Disease control	1.37	1.37	1.37
Total growing cost	489.66	456.5	461.31

Reasons for change

Controlled traffic system

- Compacted traffic zone allows for better timing of operations and less damage during wet years
- Considerable reduction in soil compaction around the sugarcane plant. Compaction has shown to cause yield decline and poor soil health
- Improved work rates because of increased speed and width of pass resulting in lower input costs
- Improved water infiltration because of less compaction
- Integrates with GPS and a zero tillage system

Double disc opener planter

- Less soil disturbance thus leading to lower weed pressure and improved soil health.
- Ability to plant through weed stubble or trash.

- Reduced number of cultivations before and after planting.
- Plant cane is less susceptible to water logging damage on a pre-formed bed.

GPS

- Important component of the controlled traffic system because of reducing soil compaction.
- GPS is a vital component of precision farming.
- Reduced overlap on operations (e.g. spraying)

Environmental benefits

- Reduced sediment, chemical and nutrient losses off farm.
- Reduced fuel usage and potential for lower chemical and fertiliser inputs.
- Improvement in soil chemical, physical and biological components.

Economic benefits

- As outlined in this paper

Social benefits

- Less time required to cover the same amount of farming area
- GPS technology has potential to reduce driver stress and fatigue.

Future direction

The new farming system is still in the early stages of development for the Pinnacle Precision Farming group and they recognise that the system will continue to improve as they become more experienced in the farming processes. In 2007 the Pinnacle Precision Farming Group will be planting a large amount of cane into pre-formed beds. The grower group is currently looking at the use of permanent beds and a zero tillage system in situations where the mound profile is still uniform over the cropping cycle. Although this is still in the early stages of development a zero tillage system would significantly reduce their planting operation time and minimise their input costs even further. The Pinnacle Precision Farming group also see the use of GPS as a key component that will fit in well with the new system in the future.

Conclusion

The new farming system has numerous social, economic and agronomic advantages compared to the old farming system. Given the shortage of labour in the sugar industry and the need to reduce costs, the Pinnacle Precision Farming group realise that maximising the efficiency of their farming operations is critical for the viability of their farming business.

Working together as a group has provided numerous benefits and allowed the efficient adoption of a new farming system across various farming environments. The Pinnacle Precision Farming Group recognise the need to continually improve and believe the new farming system principles will provide a sound basis for long term sustainability of the sugarcane industry.

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